APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/761,152	01/17/2001	Alan S. Ward	TI-32480	3701

			EXAMINER
23494	7590	09/13/2004	ROCHE, TRENTON J

TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, M/S 3999
DALLAS, TX 75265

ART UNIT	PAPER NUMBER
2124	

DATE MAILED: 09/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

	Application No.	**Applicant(s)**
Office Action Summary	09/761,152	WARD ET AL.
	Examiner	**Art Unit**
	Trent J Roche	2124

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 May 2004*.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6,10-19 and 24-33* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *10-19* is/are allowed.

6)☒ Claim(s) *1,2,24 and 26-33* is/are rejected.

7)☐ Claim(s) *3-6* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on *23 April 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other: _____.

DETAILED ACTION

1.   This office action is responsive to Amendment A filed 18 May 2004

2.   Per applicant's request, amended claims 1-6, 10 and 12-19 have been entered. New claims

24-33 have been entered. Claims 7-9 and 20-23 have been canceled.

3.   Claims 1-6, 10-19 and 24-33 have been examined.

Claim Objections

4.   Claim 3 is objected to because of the following informalities: There appears to be a type in

the phrase "displaying sets optimal solutions." For purposes of examination this will be interpreted

to read "displaying sets of optimal solutions." Appropriate correction is required.

Allowable Subject Matter

5.   Independent claims 3 and 10 contain allowable subject matter.

6.   The following is a statement of reasons for the indication of allowable subject matter:

Independent claim 3 recites a method for *compiling an application program, comprising compiling said*

application program with a first set of compiler options in a manner that optimizes one application characteristic,

subject to limits on another application characteristic to provide a first executable, compiling said application program

with a second set of compiler options in a manner that optimizes said other application characteristic, subject to limits

on said one application characteristic to provide a second executable, generating profile information from said first and

second executables, generating and displaying sets of optimal solutions from said profile information wherein the sets

have methods of compiling at the function level in a solution space generator, and automatically selecting and applying

function level compiler options for said application program based upon selected optimal solutions so as to optimize said

application program. (claim 3) The prior art of record, specifically Granston, does not explicitly teach or suggest generating and displaying **sets of optimal solutions from said profile information wherein the sets have methods of compiling at the function level in a solution space generator,** and automatically **selecting and applying function level compiler options for said application program based upon selected optimal solutions**... (emphasis added) Rather, Granston discloses the ability to generation profile information for an application, and using said profile information, applying compiler options to the program for optimization. Granston does not explicitly disclose that the solution sets have methods of compiling at the function level, and based upon these function level solution sets, applying function level compiler options.

Independent claim 10 recites similar limitations as that of claim 3. Specifically Granston does not explicitly teach or suggest **applying said profile information to a solver; generating sets of useful solutions from said solver wherein the sets have methods for compiling each function; and selecting a solution for said application program using said useful solutions**... (claim 10).

Claim Rejections - 35 USC § 102

7.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8.   Claims 1, 26 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,966,538 to Granston et al, hereafter referred to as Granston.

Regarding claim 1:

Granston teaches:

- a method for automatically compiling an application program in a manner that optimizes one application characteristic, subject to limits on another application characteristic ("a method and apparatus for automatically determining which compiler options should be used in compiling a computer program" in col. 1 lines 53-55. Further, "the user's compile-time tolerance is assigned a value of either 'low', 'medium' or 'high'. A value of low indicates that reducing compile time should be a primary goal. Consequently, the optimization routine of the present invention does not recommend the no-limit option..." in col. 5 lines 38-42. The compiler option is constrained by the status of the no-limit option.)

- compiling said application with two or more different sets of compiler options that optimizes one application characteristic, subject to limits on another application characteristic to provide two or more executables, generating profile information from said executables, generating optimal solutions using said profile information ("the present invention utilizes information obtained from interviewing the computer user, compile-time information obtained during one or more compilations of the program, and profile information collected at run time" in col. 1 line 67 to col. 2 line 3. Further, the compiler is compiling the application with multiple compiler options, as one option would relate to the no-limit option, and another option would be the optimizing option.)

- automatically selecting and applying function level compiler options for said application program based upon said optimal solutions ("the present invention may also utilize profile information obtained during execution of the program to determine which compiler options

should be applied when compiling a particular application...the user makes the appropriate

selection to cause the CPU to compile with the new options" in col. 4 lines 35-38 and 61-64.

The user selects the recommendations, and the compiler automatically applies the compiler

options that were suggested to the user. Further, "to provide recommendations for each

individual module of the program. Providing compiler option recommendations for each

individual module allows the user to optimize hot modules...aggressively and cold

modules...less aggressively or not at all..." in col. 4 lines 52-58.)

substantially as claimed.

Regarding claim 26:

Granston teaches:

- an apparatus for automatically generating an optimal code for an application where

    conflicting characteristics exist comprising means for compiling with a compiler option to

    constrain a first characteristic and optimize the other characteristic ("a method and

    apparatus for automatically determining which compiler options should be used in compiling

    a computer program" in col. 1 lines 53-55. Further, "the user's compile-time tolerance is

    assigned a value of either 'low', 'medium' or 'high'. A value of low indicates that reducing

    compile time should be a primary goal. Consequently, the optimization routine of the

    present invention does not recommend the no-limit option..." in col. 5 lines 38-42. The

    compiler option is constrained by the status of the no-limit option. Further, characteristics

    are inherently conflicting when attempting to optimize a program.)

- means for compiling said application with a compiler option to constrain said other

    characteristic and optimize the first characteristic to provide solutions and means for

automatically selecting compiler options for said application based upon said solutions ("the

present invention may also utilize profile information obtained during execution of the

program to determine which compiler options should be applied when compiling a

particular application…the user makes the appropriate selection to cause the CPU to

compile with the new options" in col. 4 lines 35-38 and 61-64. The user selects the

recommendations, and the compiler automatically applies the compiler options that were

suggested to the user. Further, "to provide recommendations for each individual module of

the program. Providing compiler option recommendations for each individual module

allows the user to optimize hot modules…aggressively and cold modules…less aggressively

or not at all…" in col. 4 lines 52-58.)

substantially as claimed.

Regarding claim 30:

Granston teaches:

-   an apparatus for automatically generating an optimal code for an application where

    conflicting characteristics exist comprising means for compiling with a compiler option to

    constrain a first characteristic and optimize the other characteristic ("a method and

    apparatus for automatically determining which compiler options should be used in compiling

    a computer program" in col. 1 lines 53-55. Further, "the user's compile-time tolerance is

    assigned a value of either 'low', 'medium' or 'high'. A value of low indicates that reducing

    compile time should be a primary goal. Consequently, the optimization routine of the

    present invention does not recommend the no-limit option…" in col. 5 lines 38-42. The

compiler option is constrained by the status of the no-limit option. Further, characteristics

are inherently conflicting when attempting to optimize a program.)

-      means for compiling said application with a compiler option to constrain said other

characteristic and optimize the first characteristic to provide a set of minimal solutions and

means for displaying and selecting said minimal solutions ("the present invention may also

utilize profile information obtained during execution of the program to determine which

compiler options should be applied when compiling a particular application...the user makes

the appropriate selection to cause the CPU to compile with the new options" in col. 4 lines

35-38 and 61-64. The system displays solutions or recommendations to the user, and the

user selects the recommendations, and the compiler automatically applies the compiler

options that were suggested to the user. Further, "to provide recommendations for each

individual module of the program. Providing compiler option recommendations for each

individual module allows the user to optimize hot modules...aggressively and cold

modules...less aggressively or not at all..." in col. 4 lines 52-58.)

substantially as claimed.

Claim Rejections - 35 USC § 103

9.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness

rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section
> 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the
> subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary
> skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the
> invention was made.

10.   Claims 2, 24, 27-29 and 31-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over

U.S. Patent 5,966,538 to Granston et al, hereafter referred to as Granston, in view of U.S. Patent

5,535,391 to Hejlsberg et al, hereafter referred to as Hejlsberg.

Regarding claim 2:

The rejection of claim 1 is incorporated, and further, Granston does not specifically disclose

compiler options for best computation time and code size, and for intermediate points between best

computation time and best code size. Hejlsberg discloses in an analogous optimization system a

compiler with options for code size and speed (Note Parameters –O2 and –O1 in col. 5 line 65 to

col. 6 line 8. –O2 relates to generating the fastest code possible, while –O1 relates to generating the

smallest code possible. Official Notice is taken that one could vary the parameters to include

intermediate points.). It would have been obvious to one of ordinary skill in the art at the time the

invention was made to use the optimization options of Hejlsberg with the automatically optimizing

compiler of Granston, enabled via the addition of instructional code, as this would allow an increase

in efficiency in the runtime of the application program in the system of Granston.

Regarding claim 24:

The rejection of claim 1 is incorporated, and further, Granston does not specifically disclose

compiler options for best computation time and code size, and power consumption. Hejlsberg

discloses in an analogous optimization system a compiler with options for code size and speed

(Note Parameters –O2, –O1, and -Z in col. 5 line 65 to col. 6 line 8. –O2 relates to generating the

fastest code possible, –O1 relates to generating the smallest code possible, and –Z relates to

suppressing unnecessary reloading of values, thereby reducing the amount of power needed and

consumed). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the optimization options of Hejlsberg with the automatically optimizing compiler of Granston, enabled via the addition of instructional code, as this would allow an increase in efficiency in the runtime of the application program in the system of Granston.

Regarding claim 27:

The rejection of claim 26 is incorporated, and further, note the rejection regarding claim 2.

Regarding claim 28:

The rejection of claim 27 is incorporated, and further, Granston does not explicitly disclose a means for inputting an upper size limit for said application. Hejlsberg discloses in an analogous optimization system a compiler with options for code size and speed (Note Parameters –O2 and –O1 in col. 5 line 65 to col. 6 line 8. –O2 relates to generating the fastest code possible, while –O1 relates to generating the smallest code possible. The optimizing compiler will inherently attempt to minimize the opposing characteristic while optimizing for one characteristic.). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the optimization options of Hejlsberg with the automatically optimizing compiler of Granston, enabled via the addition of instructional code, as this would allow an increase in efficiency in the runtime of the application program in the system of Granston.

Regarding claim 29:

The rejection of claim 27 is incorporated, and further, Granston does not explicitly disclose a means for inputting an upper computation time limit for said application. Hejlsberg discloses in an

analogous optimization system a compiler with options for code size and speed (Note Parameters –

O2 and –O1 in col. 5 line 65 to col. 6 line 8. –O2 relates to generating the fastest code possible,

while –O1 relates to generating the smallest code possible. The optimizing compiler will inherently

attempt to minimize the opposing characteristic while optimizing for one characteristic.). It would

have been obvious to one of ordinary skill in the art at the time the invention was made to use the

optimization options of Hejlsberg with the automatically optimizing compiler of Granston, enabled

via the addition of instructional code, as this would allow an increase in efficiency in the runtime of

the application program in the system of Granston.

Regarding claim 31:

The rejection of claim 30 is incorporated, and further, Granston does not explicitly disclose a

solution in the set of minimal solutions is such that the apparatus cannot compile an alternate

solution that is both smaller in size and in computation time. Hejlsberg discloses in an analogous

optimization system a compiler with options for code size and speed (Note Parameters –O2 and –

O1 in col. 5 line 65 to col. 6 line 8. –O2 relates to generating the fastest code possible, while –O1

relates to generating the smallest code possible. The optimizing compiler will inherently attempt to

minimize the opposing characteristic while optimizing for one characteristic, and as such would not

be able to make one that is smaller in size and computation time.). It would have been obvious to

one of ordinary skill in the art at the time the invention was made to use the optimization options of

Hejlsberg with the automatically optimizing compiler of Granston, enabled via the addition of

instructional code, as this would allow an increase in efficiency in the runtime of the application

program in the system of Granston.

Regarding claim 32:

Granston teaches:

- a method for automatically generating an optimal code for an application ("a method and apparatus for automatically determining which compiler options should be used in compiling a computer program" in col. 1 lines 53-55)

- compiling, measuring and recording information relating to functions in an application ("the present invention utilizes information obtained from interviewing the computer user, compile-time information obtained during one or more compilations of the program, and profile information collected at run time" in col. 1 line 67 to col. 2 line 3)

- means for generating a set of minimal solutions for the application ("the present invention may also utilize profile information obtained during execution of the program to determine which compiler options should be applied when compiling a particular application...the user makes the appropriate selection to cause the CPU to compile with the new options" in col. 4 lines 35-38 and 61-64)

substantially as claimed. Granston does not explicitly disclose information regarding size and computation time, and generating a solution that cannot be both smaller in size and computation time. Hejlsberg discloses in an analogous optimization system a compiler with options for code size and speed (Note Parameters −O2 and −O1 in col. 5 line 65 to col. 6 line 8. −O2 relates to generating the fastest code possible, while −O1 relates to generating the smallest code possible. The optimizing compiler will inherently attempt to minimize the opposing characteristic while optimizing for one characteristic, and as such would not be able to make one that is smaller in size and computation time.). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the optimization options of Hejlsberg with the automatically optimizing compiler of

Granston, enabled via the addition of instructional code, as this would allow an increase in efficiency in the runtime of the application program in the system of Granston.

Regarding claim 33:

The rejection of claim 32 is incorporated, and further, Granston discloses the steps of linear programming and heuristics to remove non-minimal solutions as claimed (Note Figure 2, item 10. Linear programming and heuristics would inherently be applied in determining recommendations and solutions.)

Double Patenting

11.   In light of the applicant's cancellation of claims 7-9 and 20-23, further coupled with the amendments to claims 1-6 and 10-19, the rejections of all claims under the judicially created doctrine of obviousness-type double patenting have been withdrawn.

Response to Arguments

12.   Applicant's arguments, filed 18 May 2004, with respect to claims 3-6 and 10-19 have been fully considered and are persuasive. The rejections of claims 3-6 and 10-19 have been withdrawn. However, Applicant's arguments, with respect to claims 1, 2, 24 and 26-33 have been fully considered but they are not persuasive.

Per claim 1:

The applicant states that Granston does not teach compiling an application with a different set of

compiler options that optimizes one application characteristic, subject to limits on another ap

placation characteristic to provide two or more executables and generating profile information from

these executables. In response, it is noted that Granston discloses a user compile-time tolerance level

which is used by the compiler to determine what type of optimization to perform. Based on this

tolerance level, the compiler will optimize the program as much as possible without breaching the

set requirements imposed by the tolerance level. As such, Granston does disclose optimizing one

application characteristic, subject to limits on another application characteristic. Further, Granston

indicates that more than one compilation can occur, and information is obtained during these

compilations ("compile-time information obtained during one or more compilations of the program,

and profile information collected at run time" in col. 1 line 67 to col. 2 line 3). As such, Granston

does disclose generating profile information from two or more executables. Finally, Granston

discloses the ability for a compiler to select and apply function level compiler options to an

application program ("to provide recommendations for each individual module of the program.

Providing compiler option recommendations for each individual module allows the user to optimize

hot modules…aggressively and cold modules…less aggressively or not at all…" in col. 4 lines 52-

58). For these reasons, the rejection of claim 1 is proper and maintained.

Per claim 2:

The applicant states that Hejlsberg does not teach generating profile information from executables

and generating optimal solutions using this profile information, and further, does not teach

automatically selecting and applying function level compiler options for said application program

based upon said optimal solutions information. As indicated in the rejection of claim 1, Granston

discloses the above limitations. Furthermore, the inclusion of Hejlsberg was to address the

limitations regarding computation time and code size as recited in claim 2. Consequently, the

applicant fails to show that the reasons to combine and motivations concerning the rejection of

claim 2 is improper. As was shown above, the rejection of claim 1 is proper, and as such, the

rejection of claim 2 is proper and maintained.

Per claims 26 and 30:

The applicant states that Granston does not teach the limitations disclosed in newly added claims 26

and 30. As is shown in the rejections of claims 26 and 30, Granston does disclose the recited

limitations.

Per claims 27-29 and 31-33:

The applicant states that Granston does not teach the limitations disclosed in newly added claims

27-29 and 31-33. As is shown in the rejections of claims 27-29 and 31-33, Granston, modified by

Hejlsberg, does disclose the recited limitations.

Conclusion

13.   Applicant's amendment necessitated the new ground(s) of rejection presented in this Office

action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is

reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS

from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the

mailing date of this final action and the advisory action is not mailed until after the end of the

THREE-MONTH shortened statutory period, then the shortened statutory period will expire on

the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be

calculated from the mailing date of the advisory action. In no event, however, will the statutory

period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner

should be directed to Trent J Roche whose telephone number is (703)305-4627. The examiner can

normally be reached on Monday - Friday, 9:00 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor,

Kakali Chaki can be reached on (703)305-9662. The fax phone number for the organization where

this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR system,

see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system,

contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Trent J Roche
Examiner
Art Unit 2124

TJR

KAKALI CHAKI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100